5-1-2002

Point of View: Artificial Intervertebral Disc Replacement Using Bioactive Three-Dimensional Fabric

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Accepted version. *Spine*, Vol. 27, No. 9 (may 1, 2002): 935-936. Publisher link.
Jeffrey M. Toth was affiliated with the Medical College of Wisconsin at the time of publication.

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The authors should be commended on their continued efforts to improve on designs for artificial discs. They present a novel design that uses a composite three-dimensional polyethylene fabric coated with a bioactive ceramic. They have presented data that support the claim that bone has the potential to bond with the device's osteoconductive ingrowth surface. However, the experimental design and relatively short-term nature of the *in vivo* study present some limitations. In the current study the height of the 10-mm artificial disc required complete removal of the endplates in order to fit the artificial disc. This may have created a different implant–bone interface than what is probably intended clinically. Thus, interface assessment from this model may or may not have clinical validity.

Biomechanical tests of the implanted discs showed an increase in laxity of the lumbar spine (neutral zone, Figure 4) compared with normal functional spinal units. Indeed, the laxity was >4° in flexion–extension for the three-dimensional fabric disc with the Kaneda SR one-rod system at 4 months. Without the use of Kaneda rod fixation, segment mobility decreased fourfold in flexion–extension and threefold in lateral bending compared with normal functional spinal units (range of motion, Figure 3). The authors attributed the increase in segmental stiffness to scar and osteophyte formation. A question remains as to whether the range of motion will continue to decrease with time. It is not possible to predict long-term behavior from a short-term study. If biologic processes involved in osteophyte formation continue with time, range of motion might continue to decrease,

and this device might behave biomechanically like a fusion device. The authors indicate that the use of temporary fixation provided a nearly physiologic mobility after fixation removal at 6 months after surgery. One may be concerned that future clinical application may necessitate removal of Kaneda instrumentation 6 months after surgery, with attendant morbidity and costs.

The possibility for the production of degradation products, creep, displacement, and dislodgement of artificial discs in general, and this device in particular, remains an obstacle to widespread clinical use. The authors are courageous for their attempts at restoring motion *versus* fusion devices. Still, there are likely consequences to restoration of segmental spinal motion. Determination of the locus for pain generation in patients remains an enigma. If a patient's pain is the result of "facet pain," segmental motion provided by the device may exacerbate this pain. In addition, segmental motion has the potential for generation of degradation products, creep, device displacement, and dislodgement. Restoration of segmental motion using disc arthroplasty *versus* discectomy and fusion is a desirable outcome, but more work is needed to avoid the potential for adverse events associated with these devices.